

providing oligonucleotides having covalently bound thereto a moiety comprising a functional group which can bind to the nanoparticles;

contacting the oligonucleotides and the nanoparticles in water for a period of time sufficient to allow at least some of the oligonucleotides to bind to the nanoparticles;

adding at least one salt to the water to form a salt solution, the ionic strength of the salt solution being sufficient to overcome at least partially the electrostatic attraction or repulsion of the oligonucleotides for the nanoparticles and the electrostatic repulsion of the oligonucleotides for each other; and

contacting the oligonucleotides and nanoparticles in the salt solution for an additional period of time sufficient to allow sufficient additional oligonucleotides to bind to the nanoparticles to produce the stable nanoparticle-oligonucleotide conjugates.

191. The method of Claim 190 wherein the nanoparticles are metal nanoparticles or semiconductor nanoparticles.

192. The method of Claim 191 wherein the nanoparticles are gold nanoparticles.

193. The method of Claim 192 wherein the moiety comprising a functional group which can bind to the nanoparticles is an alkanethiol.

194. The method of Claim 190 wherein all of the salt is added to the water in a single addition.

195. The method of Claim 190 wherein the salt is added gradually over time.

196. The method of Claim 190 wherein the salt is selected from the group consisting of sodium chloride, magnesium chloride, potassium chloride, ammonium chloride, sodium acetate, ammonium acetate, a combination of two or more of these salts,

one of these salts in a phosphate buffer, and a combination of two or more these salts in a phosphate buffer.

197. The method of Claim 196 wherein the salt is sodium chloride in a phosphate buffer.

198. The method of Claim 190 wherein nanoparticle-oligonucleotide conjugates are produced which have the oligonucleotides present on surface of the nanoparticles at a surface density of at least 10 picomoles/cm².

199. The method of Claim 198 wherein the oligonucleotides are present on surface of the nanoparticles at a surface density of at least 15 picomoles/cm².

200. The method of Claim 199 wherein the oligonucleotides are present on surface of the nanoparticles at a surface density of from about 15 picomoles/cm² to about 40 picomoles/cm².

201. A method of binding oligonucleotides to nanoparticles to produce nanoparticle-oligonucleotide conjugates, the method comprising:

providing oligonucleotides, the oligonucleotides comprising at least one type of recognition oligonucleotides, each of the recognition oligonucleotides comprising a spacer portion and a recognition portion, the spacer portion being designed so that it can bind to the nanoparticles; and

contacting the oligonucleotides and the nanoparticles under conditions effective to allow at least some of the recognition oligonucleotides to bind to the nanoparticles to produce the nanoparticle-oligonucleotide conjugates.

202. The method of Claim 201 wherein each of the spacer portions of the recognition oligonucleotides has a moiety covalently bound thereto, the moiety comprising a functional group which can bind to the nanoparticles

203. The method of Claim 201 wherein the nanoparticles are metal nanoparticles or semiconductor nanoparticles.

204. The method of Claim 203 wherein the nanoparticles are gold nanoparticles.

205. The method of Claim 204 wherein the spacer portion comprises at least about 10 nucleotides.

206. The method of Claim 205 wherein the spacer portion comprises from about 10 to about 30 nucleotides.

207. The method of Claim 206 wherein the bases of the nucleotides of the spacer are all adenines, all thymines, all cytosines, all uracils, or all guanines.

208. A method of binding oligonucleotides to nanoparticles to produce nanoparticle-oligonucleotide conjugates, the method comprising:

providing oligonucleotides, the oligonucleotides comprising:

a type of recognition oligonucleotides; and

a type of diluent oligonucleotides;

contacting the oligonucleotides with the nanoparticles under conditions effective to allow at least some of each of the types of oligonucleotides to bind to the nanoparticles to produce the nanoparticle-oligonucleotide conjugates.